Space Weather Forecast

Issued on Tuesday, 05 April 2022 at 01:19 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Minor/Moderate G1/G2 geomagnetic storm likely midweek UTC from 03 April Coronal Mass Ejection (CME). Another CME is undergoing assessment.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been low over the past 24 hours. The largest X-ray flare of the period was a protracted event that peaked in common class at 04/0743UTC. The source was over the northwestern solar horizon, but likely corresponds to the vicinity of the now-departed recent active sunspots that produced much of last week's activity.

There are currently up to five sunspots on the sun, with the development of an additional small bipolar region n the second half the UTC day on the southeast quarter of the sun. The largest region on the sun currently lies near the middle of the facing side, but this has remained relatively subdued despite its size. To its immediate south, a smaller bipolar group showed a declining trend, while two small unipolar groups remained unchanged in the eastern solar hemisphere.

At 04/2113UTC a filament eruption occurred in the south central portion of the sun, with this event visible in extreme UV satellite imagery as well as near infrared ground-based telescopes. This event was tied to a small common-class flare, and given its central location may well carry an Earth-directed component. This will be analysed as and when triangulating satellite imagery becomes available, with updates to follow. With the caveat that the above event remains unaccounted for, three CMEs were in evidence in available imagery for the UTC day of Monday 04 April. These three have been modelled and carry no Earth-directed component.

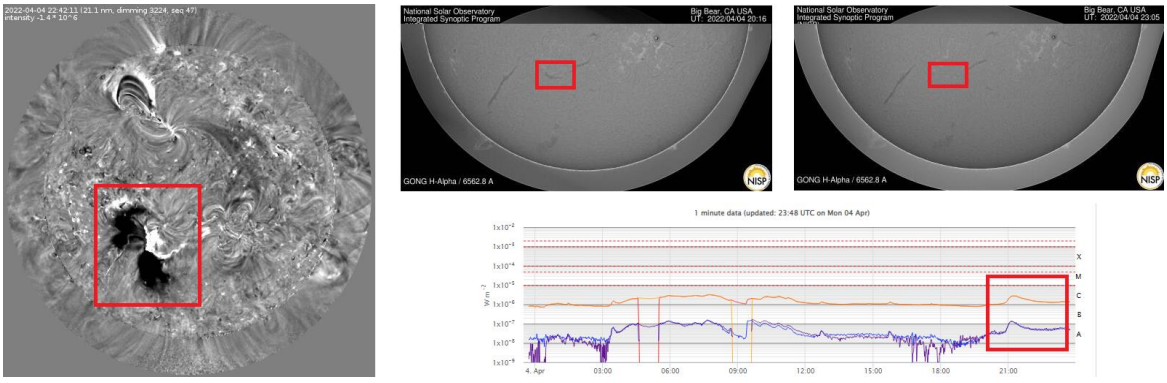

Figure 1: Clockwise from left: time-integrated extreme UV satellite image showing a possible filament eruption boxed red from 04/2100UTC. Also shown are near infra red ground-based telescope images before and after the event, as well as X-ray flux for the period. Triangulating imagery is not yet available to determine if there has been any Earth-directed CME, with updates to follow.

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Solar Wind / Geomagnetic Activity: The solar wind was perhaps symptomatic of a stubborn connection with a high speed stream, however it underwent occasional resurgences in speed perhaps indicating the connection is tenuous or that Earth is skirting the periphery of its influence. The solar wind speed showed an erratic overall downward trend, falling from elevated to slightly elevated levels. The number of particles in the solar wind and their associated magnetic field were both unremarkable and within normal background limits, although the magnetic field was often anti-aligned with Earth's field to some degree to greater geomagnetic effect.

The net result of the above solar wind measures was somewhat erratic, in tandem with the character of the wind, albeit falling short of Minor Storm G1, provisionally peaking during the early hours UTC.

Energetic Particles / Solar Radiation: Solar radiation levels showed a continuing gradual relaxation towards background levels, having reached S1/Minor Storm on 02 April, in the wake of a moderate-class X-ray flare from the northwest of the sun, from a region that has now left the Earth-facing side.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity should be predominantly low, with relatively fewer and less complex active regions on the visible side of the sun than of late.

Solar Wind / Geomagnetic Activity: The current 'coronal hole' high speed stream is the only one in the forecast, and an exit to a slow wind regime is expected for day one, Tuesday 05 April, with geomagnetic activity then largely quiet in the absence of CME(s).

There is one confirmed CME in the forecast at present, that from the 03/1500UTC 'filament eruption' (arc of plasma leaving the sun). This is due to arrive around 06/1200UTC, with the likely result of a Minor or Moderate G1/G2 geomagnetic storm intervals, perhaps continuing into the start of Thursday 07 April.

In addition to this confirmed CME, a second central 'filament eruption' observed to peak around 04/2100UTC has yet to be analysed but may well also feature in the forecast, with updates to follow as and when confirming imagery becomes available.

Energetic Particles / Solar Radiation: The risk of further solar radiation storms should now slowly reduce as last week's highly active northwestern sunspot regions rotate further onto the far side. The residual risk from current front side groups is much lower given their quiescent behaviour.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	70	30	1
Strong	G3	No	1	5	2	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	20	20	20	20
Very Active	R3 to R5 X	No	1	1	1	1

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	15	10	5	5
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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